

*Epidemiology and Ecology of
Salmonella enteritidis in Poultry: 38 150
General Issues and Research
Needs*

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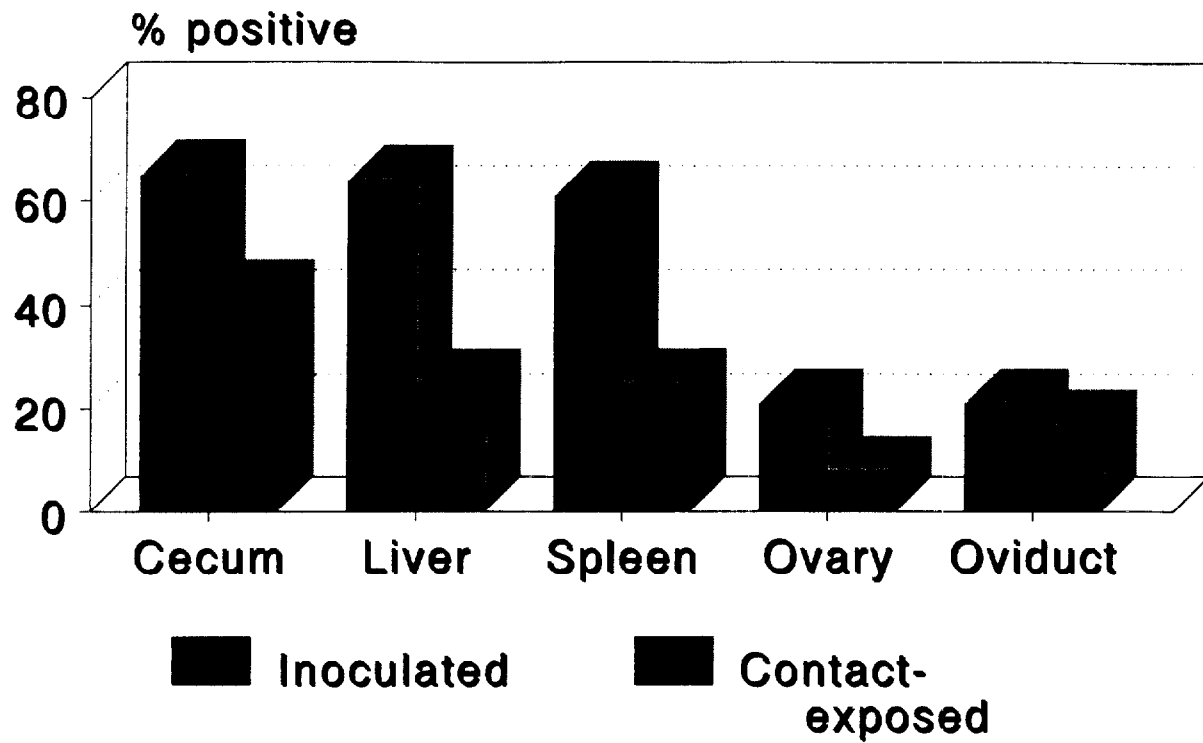
Principal Issues in the Epidemiology and Ecology of *S. enteritidis* in Commercial Egg-Laying Flocks

- The course of *S. enteritidis* infection in individual hens and the production of eggs with contaminated contents.
- The sources of introduction of *S. enteritidis* into laying houses.
- The reservoirs of persistence and mechanisms of transmission of *S. enteritidis* within laying houses.

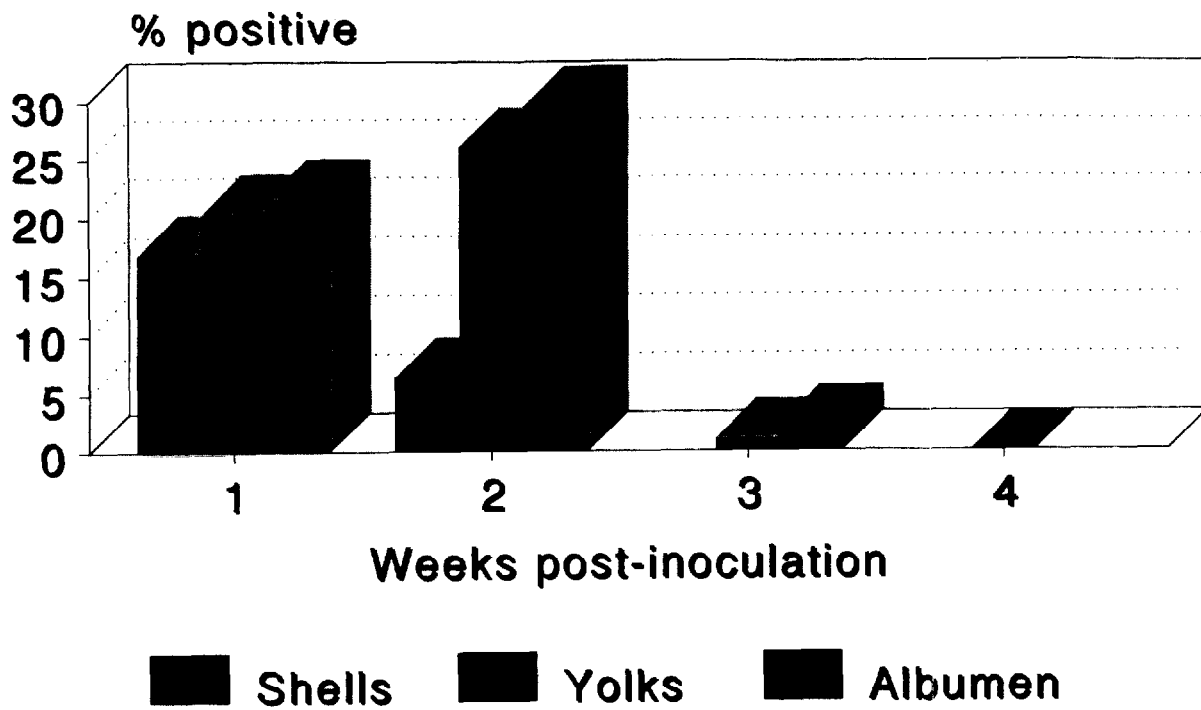
Question 1

How does *S. enteritidis* infection of laying hens result in the production of contaminated eggs?

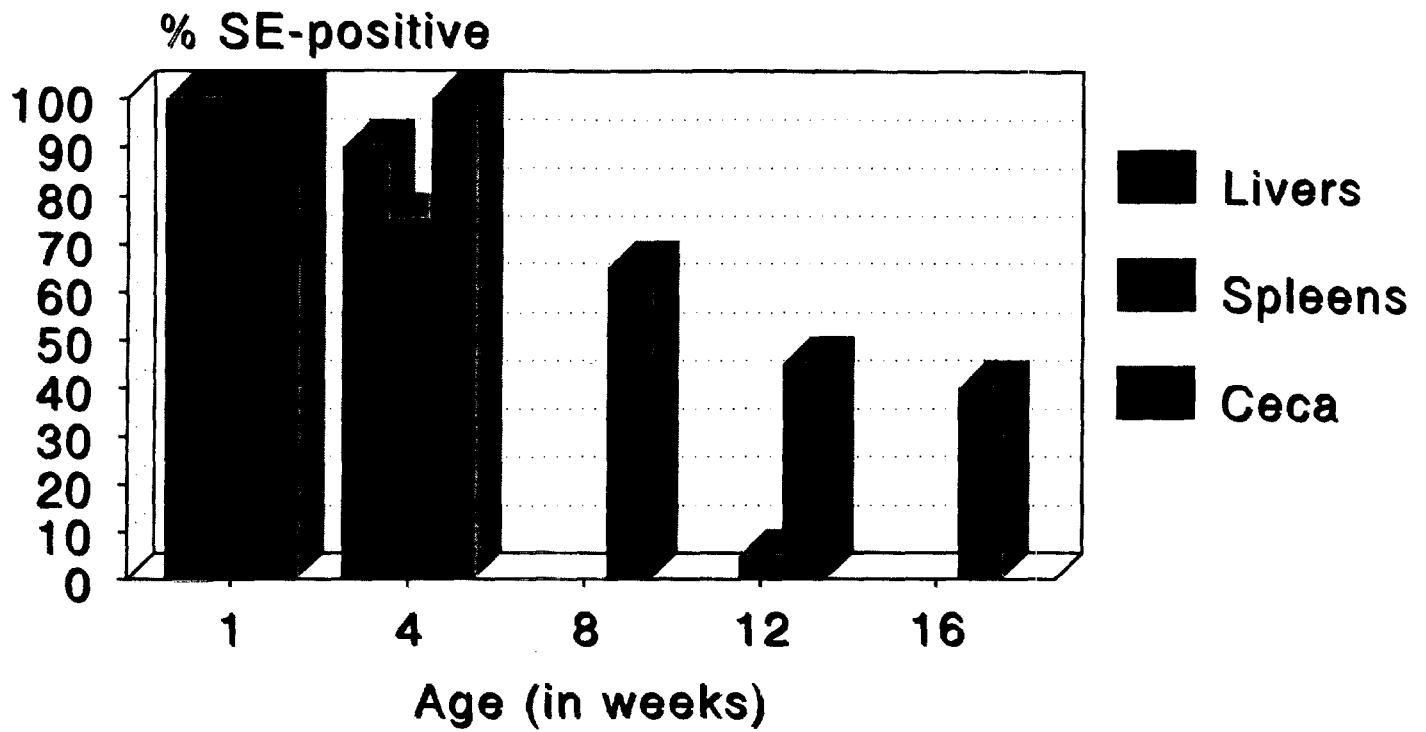
Recovery of S. enteritidis from internal organs of experimentally infected hens



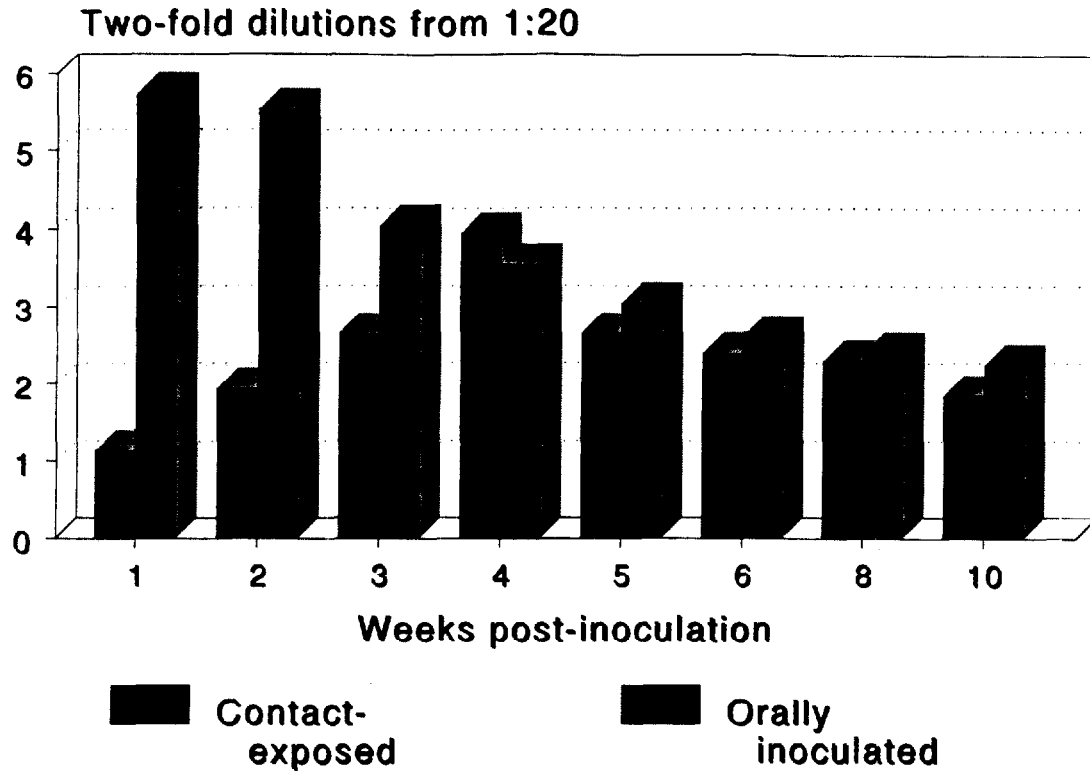
***Recovery of S. enteritidis from eggs
laid by experimentally infected hens***



***Persistence of SE in Tissues after
Oral Inoculation at 1 Day of Age***



Serum Antibody Titers (Microagglutination Test)
(Experimental *S. enteritidis* Infection Study)



***S. enteritidis* Infections in Laying Hens: Research Needs**

- Information about bacteriological and serological characteristics of infected hens that can be used to detect positive flocks.
- Details about the course of infection and host responses to infection to support development of more effective preventive and therapeutic treatments (including vaccines, competitive exclusion cultures, and antibiotics).
- Further characterization of the process by which *S. enteritidis* is deposited in eggs (and the nature of egg contamination) to support effective application of post-production control strategies such as refrigeration.

Question 2

How is *S. enteritidis* introduced into laying flocks?

Sources of S. enteritidis in Laying Flocks

- Chicks (from breeder flocks and hatcheries)
- Poultry house environment (from previous flocks)
- Rodents, insects, wildlife, domestic animals, and humans
- Feed

Selected Conclusions of the Pennsylvania S. enteritidis Pilot Project

- The proportion of environmental samples positive for *S. enteritidis* correlated with the prevalence of egg contamination.
- Heavy mouse infestations were associated with a significantly higher likelihood of environmental contamination with *S. enteritidis*.
- Only 50% of houses with positive environments were converted to negative status by cleaning and disinfection.

***S. enteritidis* Sources in Laying Flocks: Research Needs**

- Determine the prevalence of *S. enteritidis* in potential sources (including breeders and chicks, rodents, insects, feed, and house environment after cleaning/disinfection).
- Establish relationships between *S. enteritidis* isolates from the various potential laying house sources and isolates that contaminate eggs and cause human illness.
- Determine whether particular sources of *S. enteritidis* are consistently important in different geographic regions and under different flock management systems.
- Evaluate the effects of intervention strategies (including cleaning/disinfection, breeder flock testing plans, rodent control, and feed treatments) on sources of *S. enteritidis* (and on egg contamination).

Question 3

How does *S. enteritidis* infection spread within laying flocks?

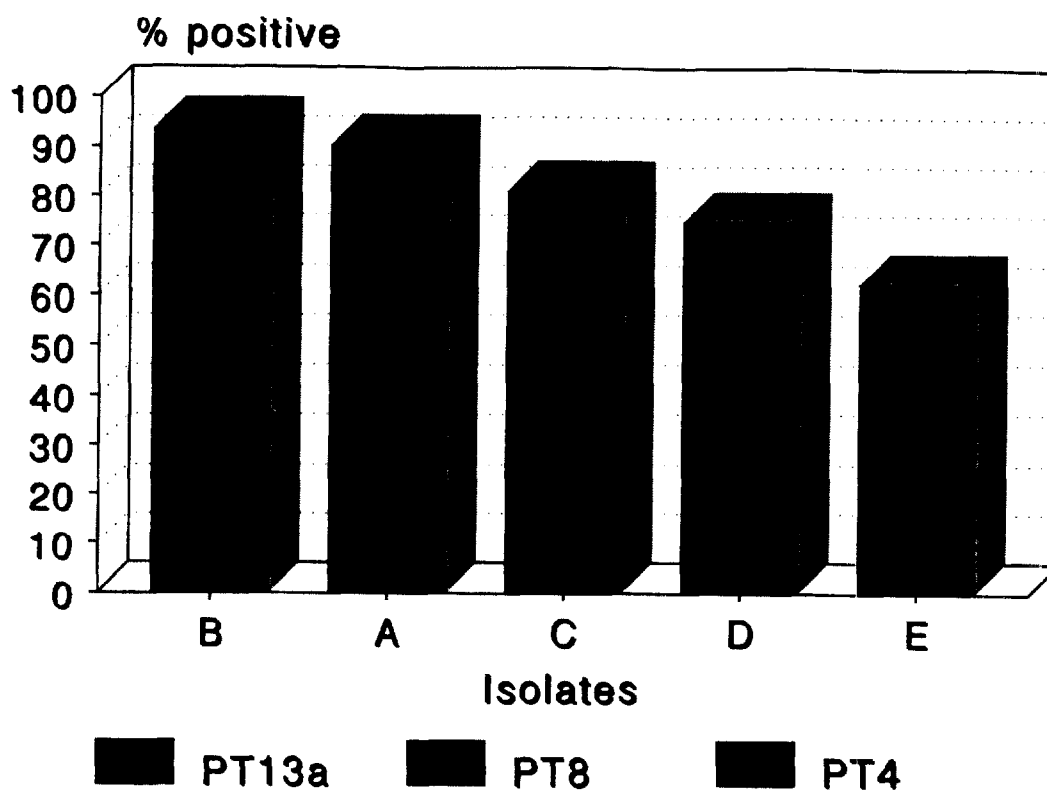
***Natural Routes of Infection for
S. enteritidis in Poultry***

- Vertical transmission from parent(s)
- Oral ingestion
- Inhalation (of aerosols or dust particles)
- Ascending infection of gastrointestinal or reproductive tracts

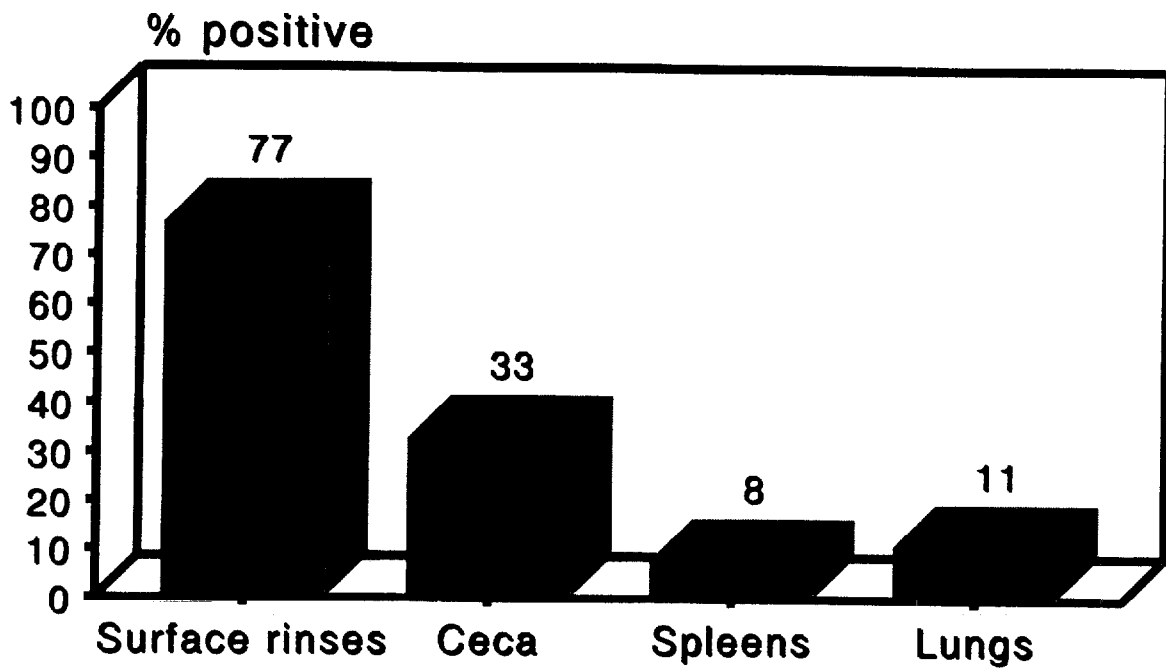
Mechanisms of S. enteritidis Transmission in Laying Flocks

- Direct bird-to-bird contact
- Vectors (biological and mechanical)
- Fomites (surfaces, equipment)
- Air circulation

***Recovery of S. enteritidis isolates
from ceca of contact-exposed chicks***



***S. enteritidis* recovery from downstream
chicks in transmission cabinets**



Transmission of *S. enteritidis* in Laying Flocks: Research Needs

- Determine the prevalence of *S. enteritidis* associated with various transmission mechanisms (including dust, moisture, rodents, and insects).
- Evaluate the effects of specific current laying house management practices and systems on *S. enteritidis* transmission.
- Develop and evaluate the efficacy of intervention strategies for disrupting *S. enteritidis* transmission (including rodent control, dust control, and moisture control).

Summary

Research to better characterize and understand the sources, reservoirs, and mechanisms of transmission of *Salmonella enteritidis* in commercial laying flocks can directly support the development of effective tools for controlling the production of contaminated eggs.